

Magnetism (chapters 20 and 21 in Giancoli)

What is/are
Magnetism?

Attraction between

- a) Special metals with quantum spin (little magnet of electron) lined up and pull/push each other.
- b) Force on moving charges due to permanent magnets or other moving charges

Magnets? Metals with electron configuration such that the quantum spins add up.

Magnetic field?

Shows the direction a compass needle will point at that point. Magnitude is defined as a Tesla, $T = \text{force per unit Ampère per metre}$.

Magnetic Force?

A wire carrying current or a moving charge in a magnetic field experiences a magnetic force, F_B .

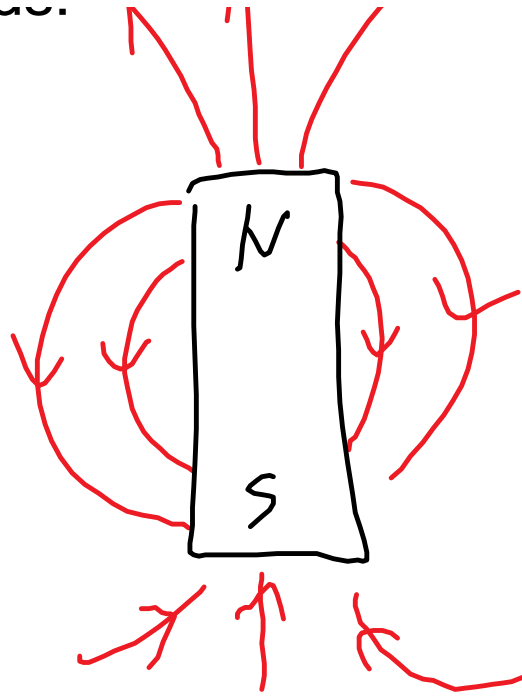
Magnetic Induction?

Moving a magnet near a coil of wire or moving the wire near a magnet induces a current in the wire.

Magnetic fields:
Bar magnet:

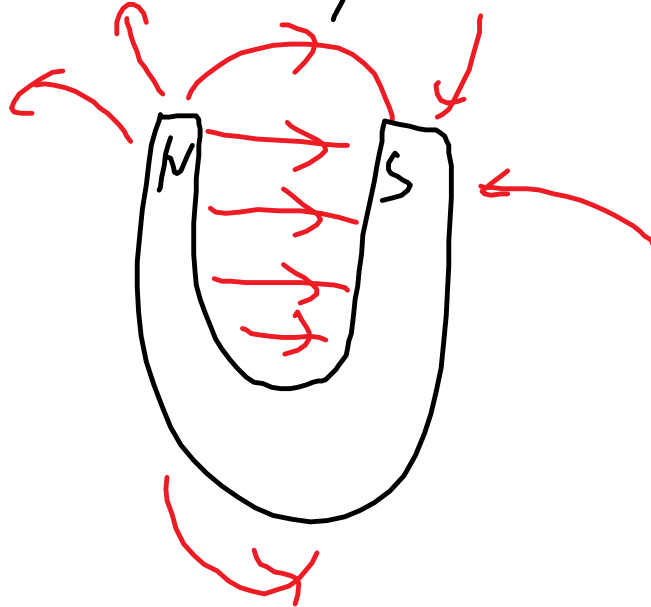


Magnetic field:
Bar magnet:



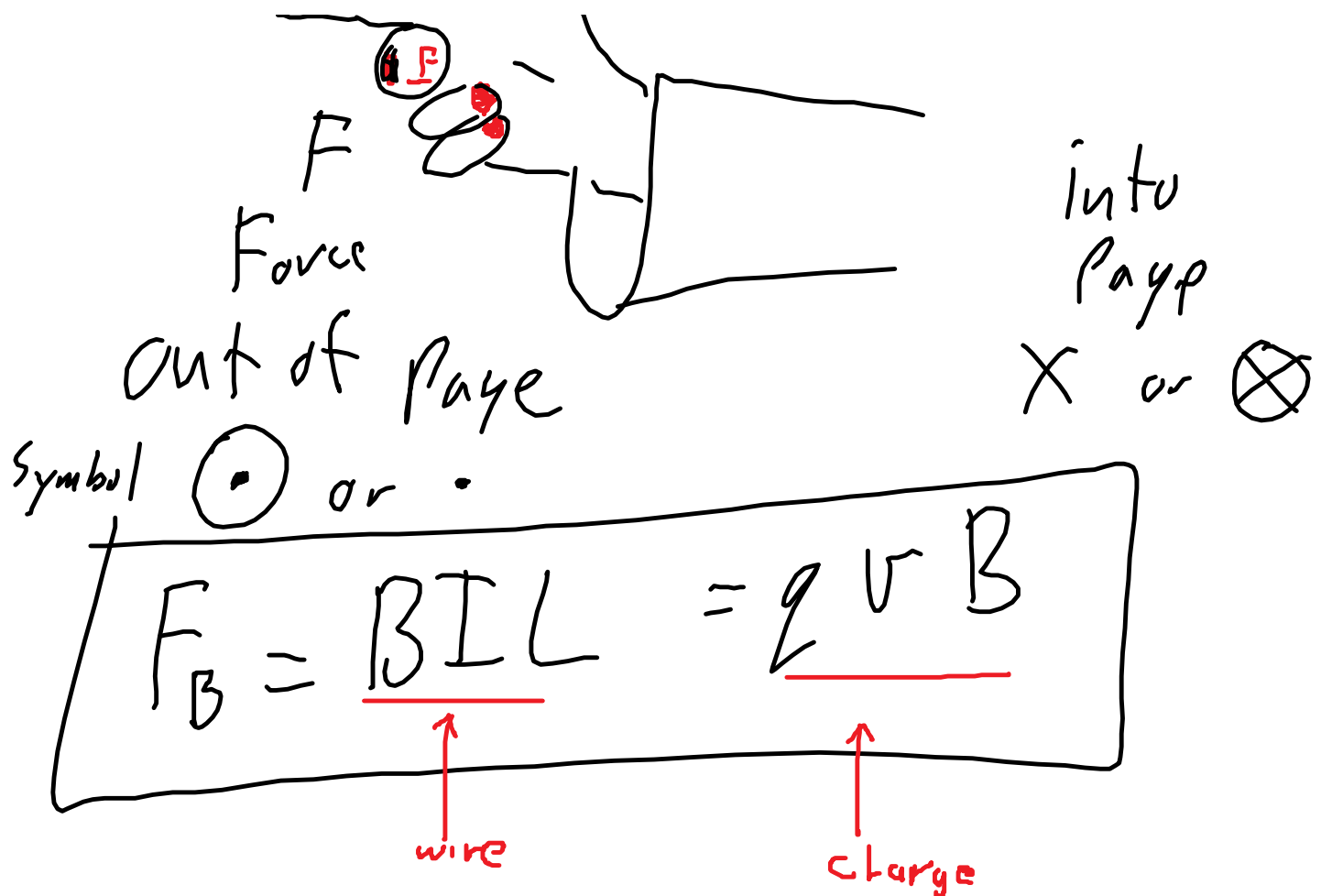
B field
goes from
North to
South

Horseshoe Magnet



Right hand rule





F_B is magnetic force, in N - perpendicular to both B and I or v.

B is magnetic field strength, in Teslas, T.

I is current, in Ampères, A.

L is the length of wire perpendicular to B.

q is the moving charge, in Coulombs, C.

v is the velocity of the moving charge perpendicular to the field, B.

P533 Q1-13 odds p532 Q1-5 odds

Test

$$V = \frac{KQ_1}{r} + \frac{KQ_2}{r}$$

v_L

$$E_k \rightarrow E_e$$

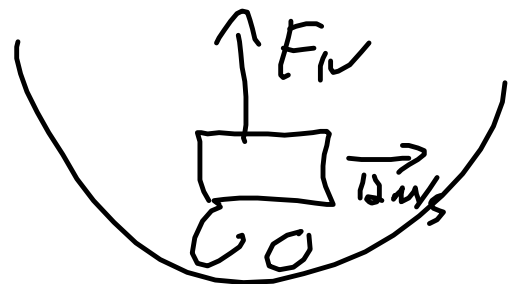
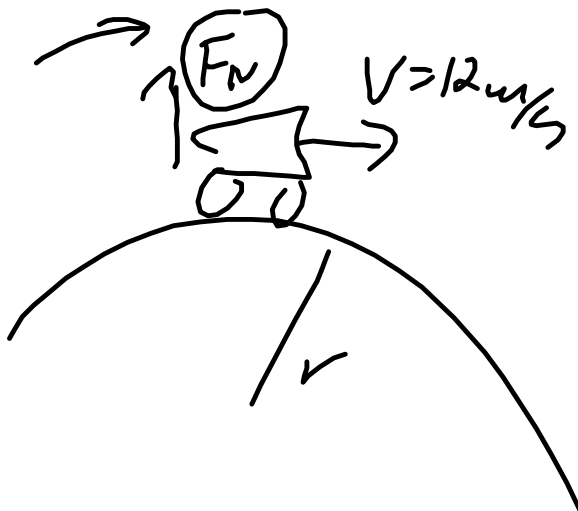
$$\frac{1}{2} m v^2 = \Delta V q$$

$$\frac{1}{2} m v^2 = (V_2 - V_1) q$$

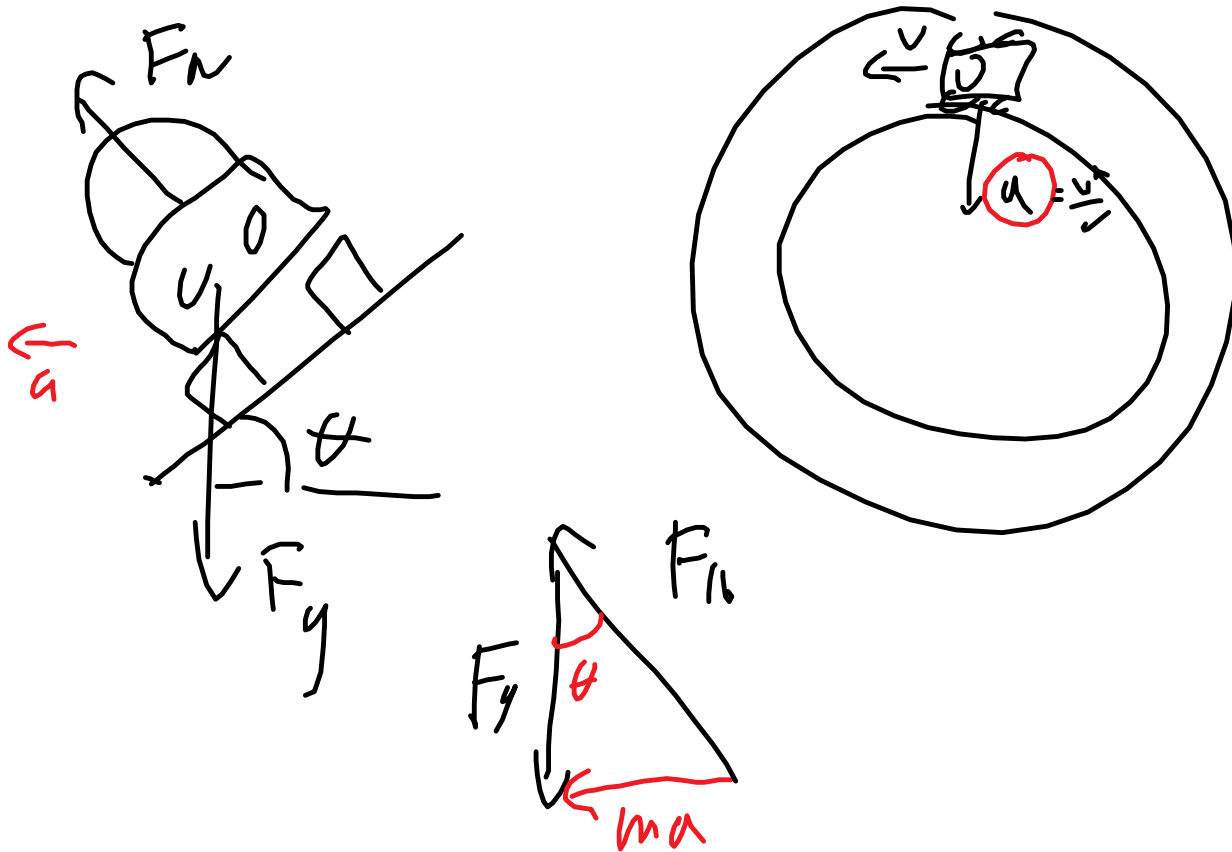
$$\frac{1}{2} (1.6 \times 10^{-27} \text{ kg}) (1.4 \times 10^6)^2 = (V_2 - \underline{1200})$$

1.6×10^{-19}

$$\underline{V_2 = 11400 \text{ V}}$$



$a =$



Magnetism (Chapters 20,21)

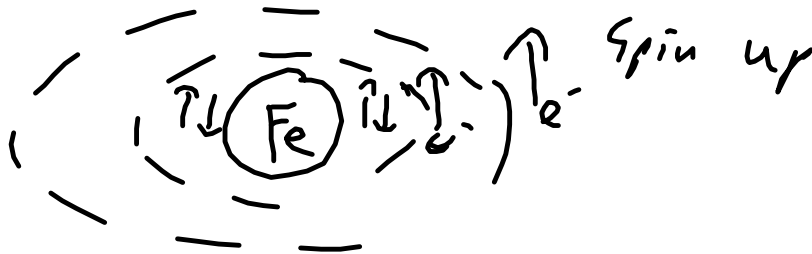
What is magnetism? What causes magnetism?
 What are magnets? What is magnetic force?
 What is magnetic induction?

Magnets have North and South Poles. Opposite poles attract, like repel.
 Both poles attract some metals, like iron. They don't attract copper, for example.

What's the deal?

2 causes for magnetism:

1 - leptons and quarks have quantum spin - they act like little magnets. Some atoms the spins can line up (iron) while not being able to rotate.



2- Moving charges produce magnetic fields.

Magnetic force is caused by moving charges in a magnetic field. Motor

Magnetic induction.

If you move a magnet near a coil of wire, a current is induced in the wire - or if you move the wire near a magnet. Generator

Magnetic Force:

Magnets:

Have a North and South pole. Opposite poles attract, like poles repel. Both poles attract some metals, like iron, but not copper for example.

If you rub an iron nail with a magnet, the nail becomes magnetic for a while.

Magnetism is caused by

1. Each subatomic particle (quarks and electrons) is a little magnet. If they line up, they can produce magnetism.
2. Moving charges also produce magnetism.

Magnetic fields, B . (Why B is the symbol for magnetic field? I don't know.)

The field lines show the direction a compass points at that point.

The field strength is measured in Teslas, T
 $1T=1N/Am$ the force on one ampère of current in a 1 m long wire in the magnetic field.

- Current or moving charges in a magnetic field experience a force, F_B .